1122B TRANSMISSION TEST SET AND 1122B-03 REMOTE DISPLAY SERVICE

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1. GENERAL

1.01 This section provides calibration procedures and troubleshooting aids for the TTI 1122B Transmission Test Set. Troubleshooting aids include a self-test routine description, a theory of operation description, and specifications.

1.02 User's questions or comments regarding the scope, accuracy, or presentation of this section will be welcomed by the publisher. All will receive thorough evaluation. When appropriate, prompt replies will be made. Address correspondence to:

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1.03 This section is published in looseleaf form to allow for insertion of changes made after printing. This method also allows insertion of

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looseleaf note paper as a convenient means for containing users' notations. When change notices are received ***insert them immediately and record their presence in the change record below.***

CHANGE RECORD

THE FOLLOWING CHANGES ARE PRESENT IN THIS SECTION	
DESCRIPTION OR TITLE	**DATE OF INSERTION**

1.04 The 1122B Test Set (Fig. 1) measures transmission level, signal frequency and noise at voice-frequency test points in telephone transmission facilities. The test set includes a signal source to generate test tones. Two front-panel, 310-type jacks are used for input connections to the instrument measuring circuitry and output connections from the signal source. In addition to these front-panel jacks, a rear-panel terminal strip may be used for semi-permanent connection into the input and output circuits. A speaker allows audible monitoring of the received or transmitted signal. The test set is also equipped with a self-test feature. Self-contained microprocessors enable the instrument to test its major circuits and produce display messages indicating the result of each test.

2. CALIBRATION

A. General

2.01 This calibration procedure may be used as needed to restore the 1122B Test Set to operation within specifications or it may be used at regular intervals to verify operation within specifications. An out-of-calibration condition may be indicated if the 1122B test results vary from those of a calibrated instrument or if the self-test routine produces a FAIL message on either the log converter test or the analog circuit test. If the instrument cannot be calibrated to operate within specifications, troubleshoot for failure.

Note: The 1122B-03 Remote Display requires no calibration.

2.02 This calibration procedure assumes that the technician is familiar with the operating procedures of the instrument. These procedures are described in Section 1122-301.

2.03 The following equipment is recommended for performing this calibration procedure. Equivalent equipment may be used if necessary.

- Variac W5MT3A
- Dana 4700 Digital Multimeter (DMM)
- Tektronix 465 Oscilloscope
- Hewlett-Packard 745A AC Calibrator
- Itron 650 Counter-Timer
- General Radio Decade Attenuator
- Hewlett-Packard 333A Distortion Analyzer

B. Preliminary Procedures

2.04 To gain access to the instrument circuit board for calibration (Fig. 2):

(a) Switch the 1122B ON/OFF switch to OFF.

(b) Place the instrument upside down. Remove screws from bottom panel.

(c) Remove bottom panel.

Note: Calibration must be performed with instrument remaining upside down. Beware of making erroneous readings on the front panel displays due to this inverted position.

Fig. 1—1122B Transmission Test Set

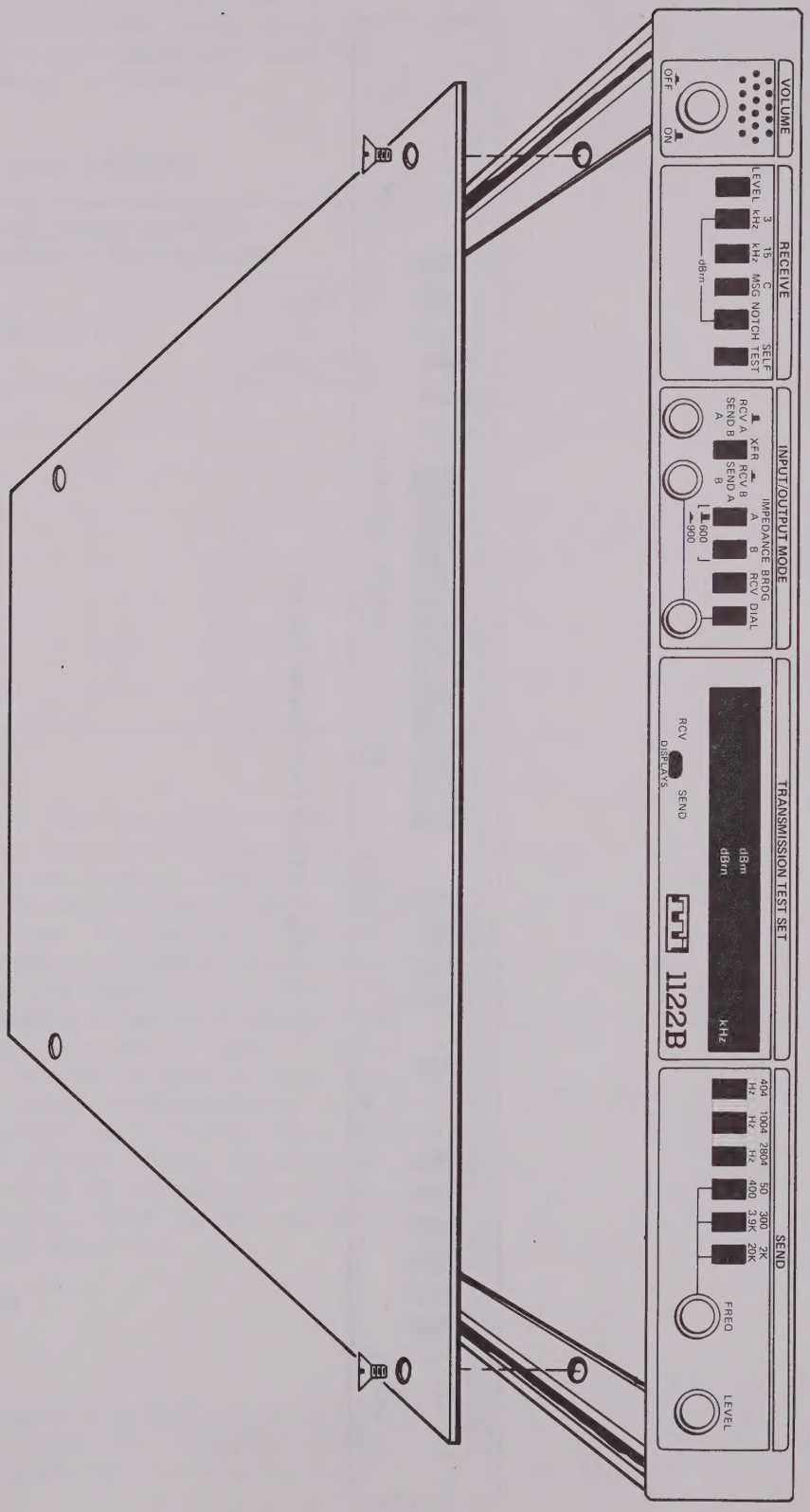


Fig. 2—Access to 1122B Main Circuit Board

C. AC Power Supply

Input Current

2.05 To measure input current requirement:

(a) Set up instruments as follows:

(1) Variac: ON/OFF switch to OFF, RANGE switch to 1A, voltage level control to maximum counterclockwise position.

(2) 1122B: ON/OFF switch to OFF.

(b) Plug 1122B ac power line into Variac output receptable.

(c) Set Variac ON/OFF switch to ON. Set 1122B ON/OFF switch to ON.

(d) Slowly turn Variac voltage level control clockwise until AC VOLTS meter indicates 120. Variac AC AMPERES meter should not indicate more than 0.1 A (100 ma).

Note: The 1122B requires a rapidly rising +5 V dc to start up properly. If the current drawn by the 1122B is normal but the display is not operating properly, turn the 1122B OFF, then back ON again. The test set circuitry resets, and the display should read normally.

Output Voltages

2.06 To test power supply output voltages:

(a) Set up DANA 4700 DMM: FUNCTION switch to DCV, RANGE to AUTO.

(b) Check for the following output voltages:

TP25	+15.0 ± 0.8 V dc
TP26	−15.0 ± 0.8 V dc
TP27	+ 5.0 + 0.3 V dc

Output Ripple

2.07 To check output ripple:

(a) Set up Tektronix Scope: VOLTS/DIV to 5m (5 mV/div), AC/GND/DC switch to AC, TIME/DIV to 1 ms.

(b) Check ripple at TP25, TP26 and TP27. Ripple at these points should not exceed 50 mV.

D. VF Circuit

Reference Voltages

2.08 To adjust reference voltages:

(a) Set up instruments as follows:

(1) HP Calibrator: VOLTAGE RANGE to 10 V, level switches to 489820, FREQUENCY RANGE to X100, FREQ Hz adjustment to 10, ERROR RANGE to 0, % ERROR adjustment to 0, LO output jack strapped to ground.

(2) Dana DMM: FUNCTION switch to DCV, RANGE switch to AUTO.

(3) Itron Counter: INPUT A connected to calibrator COUNTER OUTPUT, MODE switch to FREQUENCY, RANGE switch to 199 kHz, SENSITIVITY switch to MAX or AUTO, TIME BASE switch to INT, STORE switch to ON, SAMPLE RATE switch to MAX.

(4) 1122B: Select LEVEL switch in the RECEIVE section, disengage all other RECEIVE switches, RCV/SEND switch to RCV, XFR switch to RCV A/SEND B, A and B switches to 600 ohms.

(b) Connect a precision 600-ohms resistor (1% tolerance) in series with the 1122B A input/output jack and the calibrator output.

(c) Connect DMM to TP3 on the vf board. Adjust R158 on the vf board for +10.654 V dc.

(d) Set the DMM FUNCTION switch to ACV. Connect the DMM to TP11 on the vf board. Adjust R133 for +1.000 V ac.

Detector Balance

2.09 To balance detector circuit:

(a) Set up instruments as follows:

(1) Dana DMM: FUNCTION switch to DCV.

(2) HP Calibrator: VOLTAGE RANGE to 100 mV.

(3) Tektronix Scope: VOLTS/DIV to 1, AC/GND/DC switch to DC, TIME/DIV to 5 ms.

(b) Adjust R143 and R201 to the center of their ranges.

(c) Connect scope to pin 4 of U7 (Fig. 3). Adjust R143 until amplitude of the lower end of the waveform is consistent (Fig. 4).

(d) Connect DMM to TP6.

(e) Set calibrator VOLTAGE RANGE to 1 V. Adjust R173 for DMM reading of +10.000 V dc.

(f) Set calibrator VOLTAGE RANGE to 100 mV. Adjust R170 for DMM reading of +1.000 V dc.

(g) Repeat (e) and (f) until consistent readings are maintained when the calibrator VOLTAGE RANGE is switched from 100 mV to 1 V.

(h) If the specified readings are not achieved, readjust R143, then continue to repeat (e) and (f).

Note: The effects of R143, R173, and R170 interact. It may be necessary to repeat the procedure several times before the specified readings are obtained.

Log Converter Reference Levels

2.10 To adjust log converter:

(a) Set up HP Calibrator: VOLTAGE RANGE to 1 V, level switches to 489820, FREQUENCY RANGE to X100, FREQ Hz adjustment to 10, ERROR RANGE to X1, % ERROR to +0.5 %.

(b) Connect DMM to TP6. DMM should read 10 V. If not, range up to 10 V on the calibrator, then back to 1 V.

(c) Adjust R158 until 1122B level display flashes between −10.0 and −10.1 dBm. This approximates a reading of −10.05 dBm.

(d) Set calibrator VOLTAGE RANGE to 100 mV. Level display should flash between −30.0 and −30.1 dBm. If not, adjust R175. DMM should read 1 V.

(e) Repeat (c) and (d) until consistent readings of −10.05 and −30.05 dBm are maintained when the calibrator is switched from 100 mV to 1 V.

2.11 To verify log converter adjustment:

(a) Set up HP Calibrator: VOLTAGE RANGE to 10 V, level switches to 154920, % ERROR to 0.

(b) Level display should read 0.0 dBm.

(c) Vary calibrator % ERROR in the negative direction until display flashes between 0.0 and 0.1 dBm. This should occur between −0.5% and −0.8% on the calibrator.

(d) Vary the calibrator % ERROR in the positive direction until display flashes between 0.0 and −0.1 dBm. This should occur between 0.5% and 0.8% on the calibrator.

Level-Measurement Auto-Ranging

2.12 To check level auto-ranging:

(a) Set up instruments as follows:

(1) HP Calibrator: VOLTAGE RANGE TO 10 V, level switches to 275490, FREQUENCY RANGE TO X100, FREQ Hz adjustment to 10, ERROR RANGE to 0, % ERROR adjustment to 0.

(2) GR Decade Attenuator: 10 dB/STEP to 0, 1 dB/STEP to 0, 0.1 dB/STEP to 0.

(b) Connect calibrator output to attenuator input in series through a 600-ohm resistor. Connect attenuator output to 1122B A input/output jack.

(c) Use the 10 dB/STEP switch on the attenuator to range down. Observe the following level display readings on the 1122B for each 10 dB step.

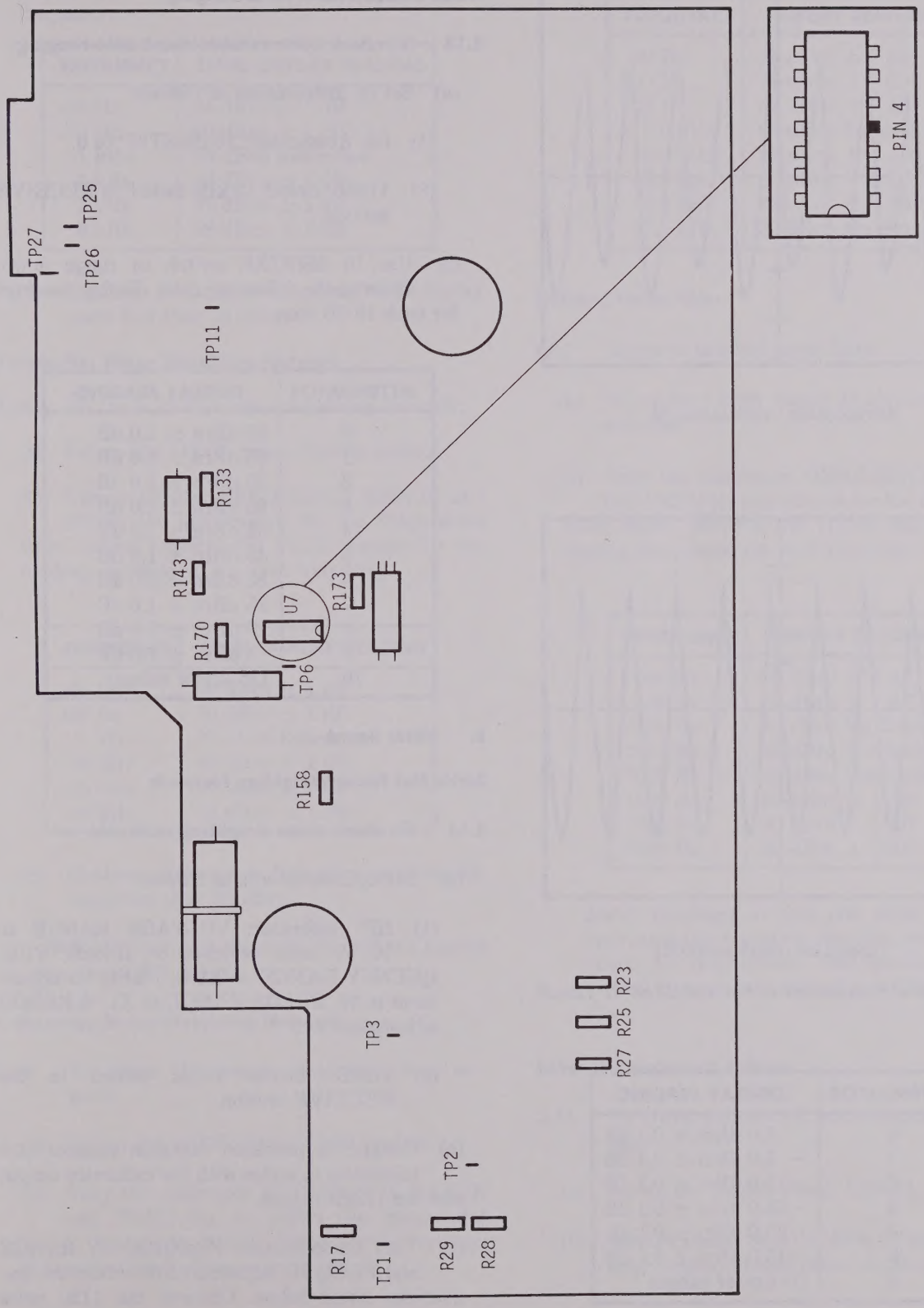
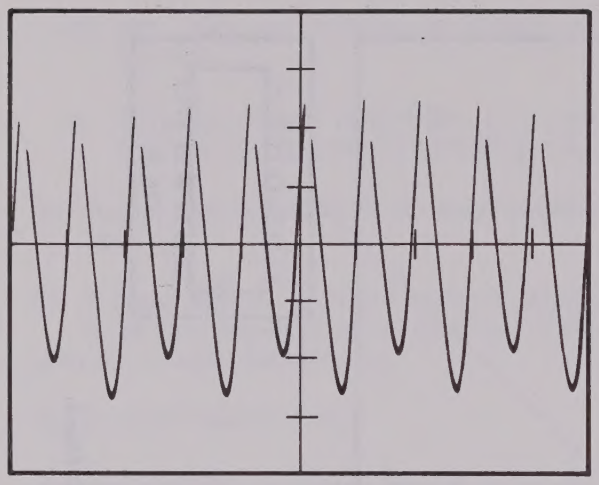
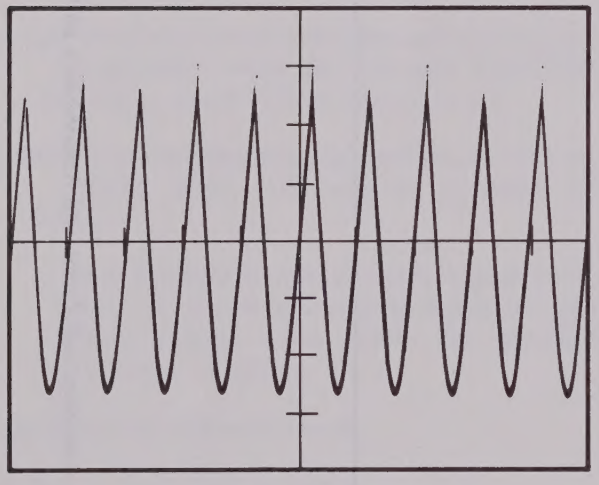


Fig. 3—Locating Test Points and Adjustments on the Main Circuit Board



INCONSISTANT LOWER AMPLITUDE



CONSISTANT LOWER AMPLITUDE

Fig. 4—Typical Waveforms at Pin 4 of U7 of VF Circuit

ATTENUATOR	DISPLAY READING
0	5.0 dBm ± 0.1 dB
1	− 5.0 dBm ± 0.1 dB
2	−15.0 dBm ± 0.1 dB
3	−25.0 dBm ± 0.1 dB
4	−35.0 dBm ± 0.1 dB
5	−45.0 dBm ± 0.1 dB
6	Ur (under range)

Noise Measurement Auto-Ranging

2.13 To check noise measurement auto-ranging:

(a) Set up instruments as follows:

(1) GR Attenuator: 10 dB/STEP to 0.

(2) 1122B: Select 15 kHz switch in RECEIVE section.

(b) Use 10 dB/STEP switch to range down. Observe the following noise display readings for each 10 dB step.

ATTENUATOR	DISPLAY READING
0	95 dBrn ± 1.0 dB
1	85 dBrn ± 1.0 dB
2	75 dBrn ± 1.0 dB
3	65 dBrn ± 1.0 dB
4	55 dBrn ± 1.0 dB
5	45 dBrn ± 1.0 dB
6	35 dBrn ± 1.0 dB
7	25 dBrn ± 1.0 dB
8	15 dBrn ± 1.0 dB
9	5 dBrn ± 1.0 dB
10	Ur (under range)

E. Filter Board

3-kHz Flat Noise Weighting Network

2.14 To check noise weighting network:

(a) Set up instruments as follows:

(1) HP Calibrator: VOLTAGE RANGE to 10 V, level switches to 154920, FREQUENCY RANGE to X100, FREQ Hz adjustment to 10, ERROR RANGE to X1, % ERROR adjustment to 0.

(2) 1122B: Select 3-kHz switch in the RECEIVE section.

(b) Connect a precision 600-ohm resistor (1% tolerance) in series with the calibrator output and the 1122B A jack.

(c) Vary the calibrator FREQUENCY RANGE and FREQ Hz adjustment to obtain the frequencies listed below. Observe the 1120 noise

display for the readings designated for each frequency.

FREQUENCY	LEVEL DISPLAY READING
60 Hz	95 dBrn ± 1 dB
400 Hz	90 dBrn ± 1 dB
1 kHz	90 dBrn Reference
2 kHz	89 dBrn ± 1 dB
3 kHz	87 dBrn ± 1 dB
6 kHz	78 dBrn ± 1 dB

(d) Continue to increase frequency until display reads less than 30 dBrn.

15-kHz Flat Noise Weighting Network

2.15 To check 15-kHz noise weighting network:

(a) Set up the 1122B: Select 15-kHz switch.

(b) Vary calibrator FREQUENCY RANGE and FREQ Hz adjustment for the frequencies listed below. Observe the 1122B display for the readings designated for each frequency.

FREQUENCY	LEVEL DISPLAY READING
60 Hz	90 dBrn ± 1 dB
400 Hz	90 dBrn ± 1 dB
1 kHz	90 dBrn Reference
10 kHz	89 dBrn ± 1 dB
15 kHz	87 dBrn ± 1 dB
30 kHz	78 dBrn ± 1 dB

(c) Continue to increase frequency until display reads less than 30 dBrn.

Note: Frequencies above 20 kHz will not appear on the 1122B display.

C-Message Noise Weighting Network

2.16 To check C-message noise weighting network:

(a) Set up the 1122B: Select CMSG switch.

(b) Vary the calibrator FREQUENCY RANGE and FREQ Hz to obtain the frequencies below. Observe the 1122B display for the readings designated for each frequency.

FREQUENCY	DISPLAY READING
60 Hz	34 dBrn ± 2 dB
300 Hz	73 dBrn ± 1 dB
700 Hz	87 dBrn ± 1 dB
1.0 kHz	90 dBrn Reference
2.0 kHz	89 dBrn ± 1 dB
3.3 kHz	85 dBrn ± 2 dB
5.0 kHz	62 dBrn ± 3 dB
15.0 kHz	30 dBrn Maximum

Notched Noise Filter

2.17 To check notched noise filter:

(a) Set up the 1122B: Select 15 kHz and NOTCH switches.

(b) Vary the calibrator FREQUENCY RANGE and FREQ Hz adjustment for the frequencies listed below. Observe the 1122B display for the reading designated for each frequency.

FREQUENCY	DISPLAY READING
300 Hz	90 dBrn ± 1 dB
400 Hz	87 dBrn ± 1 dB
995 Hz	40 dBrn Maximum
1010 Hz	30 dBrn Maximum
1025 Hz	40 dBrn Maximum
1182 Hz	87 dBrn ± 1 dB
1700 Hz	90 dBrn ± 1 dB
3000 Hz	90 dBrn ± 1 dB

Note: Readings at 995 and 1025 should be approximately the same, since the notch at 1010 should be symmetrical. This symmetry is not critical, however, to operation within specifications.

Level-Measurement Balance

2.18 To check balance of level-measurement circuitry:

(a) Set up the 1122B: Select LEVEL switch.

(b) Display should read 0.0 dBm. Reverse tip and ring. Display should read 0.0 dBm.

(c) Remove the 600-ohm resistor from the input of the 1120. Select the A RCV BRDG mode with the 1122B INPUT/OUTPUT MODE switch. Display should read 6.0 dBm ± 0.3 dB.

(d) Reverse tip and ring. Display should read 6.0 dBm ± 0.3 dB.

(e) Set calibrator level switches to 189100. Connect a 900-ohm resistor in series with output of the calibrator and the A input/output jack of the 1122B test set. Using the 1122B A switch, select 900-ohm termination.

(f) Display should read 0.0 dBm ± 0.3 dB. Reverse tip and ring. Display should read 0.0 dBm ± 0.3 dB.

(g) Repeat (b) through (f) on 1122B B jack.

F. Oscillator

Reference Voltages

2.19 To adjust oscillator reference voltages:

(a) Set up instruments as follows:

(1) Dana DMM: FUNCTION switch to DCV, RANGE switch to AUTO.

(2) Tektronix Scope: VOLTS/DIV to 1, AC/GND/DC switch to AC, TIME/DIV to 5 ms.

(b) Connect DMM to TP1. Adjust R17 for a reading of 10 V dc.

(c) Adjust R28 and R29 to the center of their ranges.

(d) Connect scope to TP2. Select 1004 Hz switch on 1122B SEND section.

(e) Adjust R28 for symmetrical waveform (see Fig. 5). Adjust R29 sine wave (see Fig. 6).

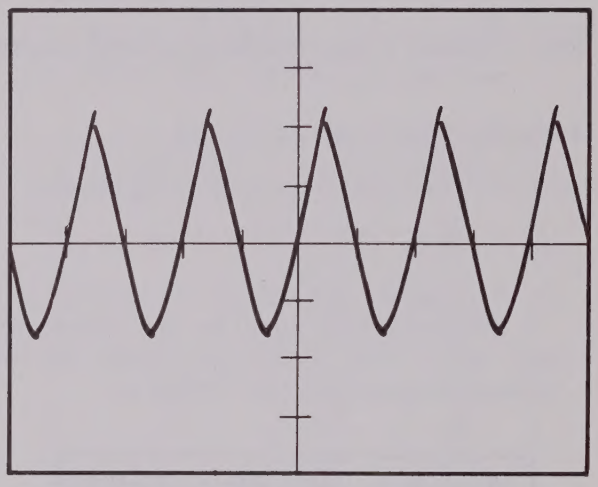
(f) Continue to adjust R28 and R29 until proper waveform is achieved.

Waveform Symmetry

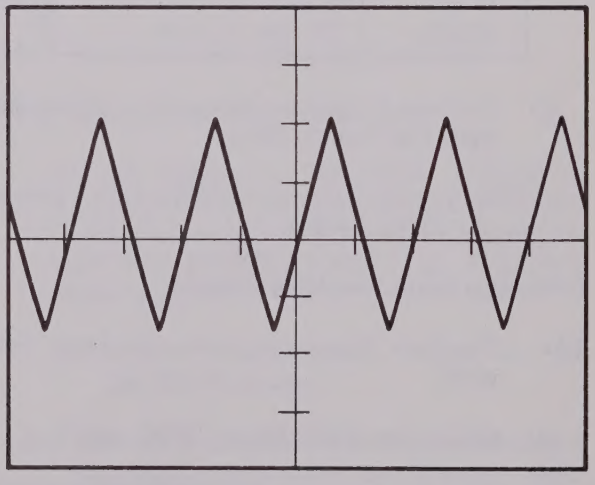
2.20 To adjust oscillator waveform symmetry:

(a) Set up HP Distortion Analyzer: FUNCTION switch to VOLTMETER, adjust meter to read 0 V on 1 V scale, FUNCTION switch to SET LEVEL, METER RANGE switch to 0, SENSITIVITY switch to 0, FUNCTION switch to DISTORTION, terminate meter in 600 ohms.

(b) Use the frequency control and BALANCE control to adjust the distortion analyzer meter for minimum distortion.



ASYMMETRICAL WAVEFORM



SYMMETRICAL WAVEFORM

Fig. 5—Typical Waveforms at TP2 of Oscillator

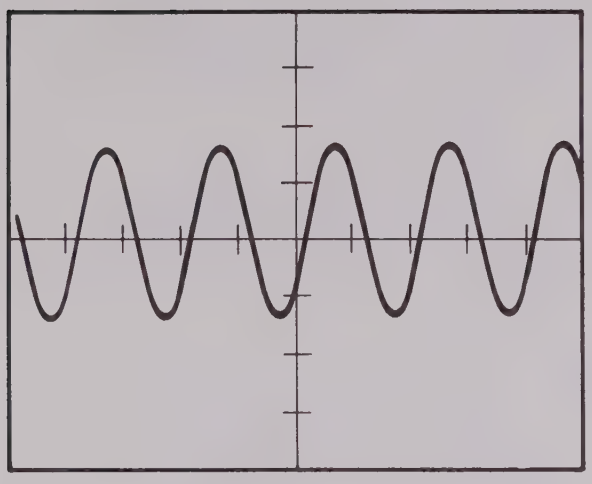


Fig. 6—Typical Sine Wave at TP2 of Oscillator

(c) Adjust R28 and R29 for minimum distortion reading on the analyzer.

Reference Frequencies

2.21 To adjust oscillator reference frequencies:

(a) Set up the 1122B: Select SEND on the RCV/SEND switch. Select 300-3.9K switch in the SEND section. Set FREQ control to the maximum counterclockwise position.

(b) Adjust R17 for a reading of 270 Hz on the 1122B frequency display.

(c) Select 404 Hz switch. Adjust R23 for a reading of 404 Hz on the display.

(d) Select 1004 Hz switch. Adjust R25 for a reading of 1004 Hz on the display.

(e) Select 2804 Hz switch. Adjust R27 for a reading of 2804 Hz on the display.

Reference Level Adjust

2.22 To adjust oscillator reference level:

(a) Set up the 1122B: RCV/SEND switch to SEND, select 1004 switch, set LEVEL control for 0.0 dBm reading on display, XFR switch to RCV A/SEND B, A and B switches to 600 ohms.

(b) Use a patch cord to connect the A jack to the B jack.

(c) Set RCV/SEND switch to RCV position. Adjust R51 for a reading of 0.0 dBm on the level display.

(d) Set RCV/SEND switch to SEND position. Set LEVEL control to the maximum counterclockwise position. Vary LEVEL control through its full range to verify output levels between −40 dBm through +10 dBm.

(e) Select 300-3.9K switch. Adjust FREQ control for reading of 1004 Hz on the frequency display.

(f) Set RCV/SEND switch to RCV. Select 15 kHz switch in the RECEIVE section. Adjust LEVEL control for a reading of 90 dBrn on the display.

(g) Select NOTCH switch in the RECEIVE section. Select 1004 Hz switch in the SEND section. Display should read 30 dBrn or less. If not, re-adjust for minimum distortion as described in 2.20.

Frequency Ranges

2.23 To check the frequency ranges:

(a) Select 50-400 Hz switch. Vary FREQ control through its full range to verify frequencies between 50 and 400 Hz.

(b) Select 300-3.9k Hz switch. Vary FREQ control through its full range to verify frequencies between 300 Hz and 3.9 kHz.

(c) Select 2K-20K Hz switch. Vary FREQ control through its full range to verify frequencies between 2 kHz and 20 kHz.

(d) Select 1004 Hz switch in the SEND section. Use LEVEL control to set level reading to 0.0 dBm.

(e) Select 2K-20K Hz switch. Use FREQ control to set frequency reading to 20 kHz. Level reading should not exceed 0.5 dBm.

(f) Select LEVEL switch in the RECEIVE section. Set RCV/SEND switch to RCV. Level reading should not exceed 0.5 dBm.

Harmonic Distortion

2.24 To verify harmonic distortion values:

(a) Distortion Analyzer: FUNCTION switch to SET LEVEL, METER RANGE switch to 0 dBm.

(b) Connect analyzer to the 1122B B jack.

(c) Use the 1122B frequency range switches and the FREQ and LEVEL controls to achieve display readings listed below. Tune distortion analyzer for minimum distortion. Observe that distortion does not exceed the values listed below for each 1122B oscillator output.

1122B OUTPUT			MAXIMUM DISTORTION
Range	FREQ	LEVEL	
50-400	100 Hz	0.0 dBm	−40 dB
	400 Hz	0.0 dBm	−50 dB
300-3.9K	300 Hz	0.0 dBm	−50 dB
	900 Hz	0.0 dBm	−50 dB
2K-20K	2 kHz	0.0 dBm	−50 dB
	20 kHz	0.0 dBm	−40 dB

3. FAILURE ISOLATION

3.01 This Part provides information to aid in isolating failure to the major assemblies or circuits of the 1122B test set and the remote display.

A. Fuses

3.02 The test set requires one 1/4 A, slow-blow fuse which is located on the rear panel. To check or replace fuse, push fuseholder and turn in the direction of the arrow marked on the holder.

3.03 The remote display requires one 1/4 A, fast-blow fuse. To check or replace fuse:

(a) Remove the screws from the rear panel of the display housing. Remove the rear panel.

(b) Remove the screws fastening the circuit board to the housing. Fuse is located on the component side of the circuit board.

B. Display/Instrument Failure Isolation

3.04 When trouble indications appear on the remote display, the failure must be isolated to either the display or the test set.

TABLE A
DISPLAY CONNECTION PROCEDURE

1122B TEST SET SERIAL NUMBER	1122B-03 DISPLAY SERIAL NUMBER	DISPLAY CONNECTION PROCEDURE
236 - 364	101 - 184	A
	185 and above	C
365 and above	101 - 184	NOTE 2
	185 and above	B

NOTES:

1. Displays with serial number 185 and above must not be intermixed with displays with serial numbers 101 - 184.
2. These test sets and displays cannot be connected.

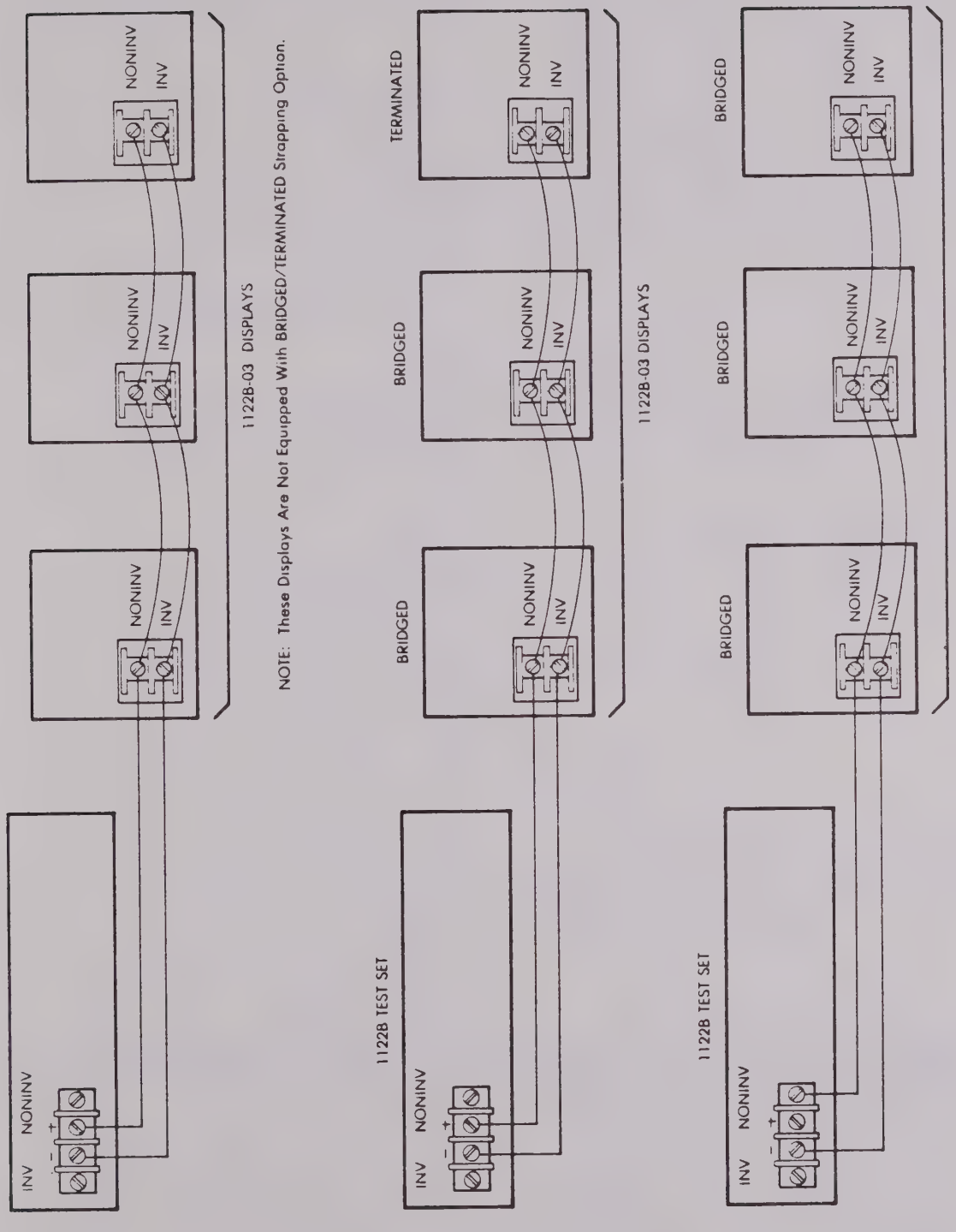
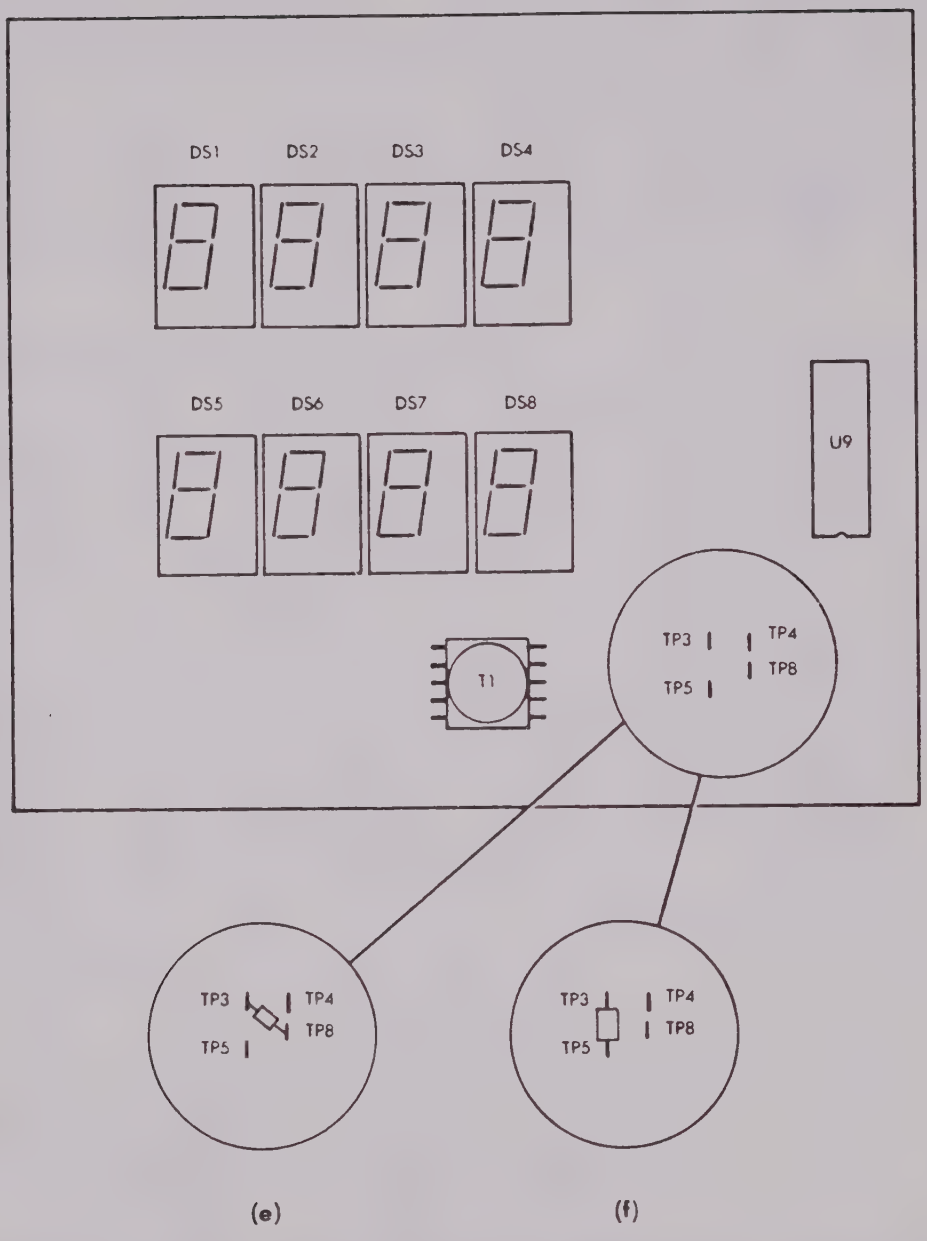


Fig. 7—Display Connection. (a) For Procedure A, (b) for Procedure B, and (c) for Procedure C. (Sheet 1 of 2).



(d)

(e)

(f)

Fig. 7—Display Connection. (d) Location of TP3, TP5, and TP8 for strapping option, (e) location of resistor for TERMINATED display, and (f) location of resistor for BRIDGED display. (Sheet 2 of 2)

Note: Remove power from test set and displays before working on connections or internal strapping. To isolate failure:

(a) Check the output from the test set with a scope. There should be a binary serial output present. If not, failure is in the test set.

(b) Check the display connections and strapping. To do this, examine the manufacturer's label affixed to the rear panels of the test set and displays. Note the serial number of each, then refer to Table A. To determine which connection and strapping option procedure should have been used. The procedures are as follows:

(1) ***Procedure A (Fig. 7a)***: Connect NONINV test set terminal to NONINV display terminal. Connect INV test set terminal to INV display terminal. Connect subsequent displays in parallel.

(2) ***Procedure B (Fig. 7b)***: Each display has a label on the rear panel describing which strapping option is in place. The final display should be strapped and marked TERMINATED and all others should be strapped and marked BRIDGED. (Displays received from the manufacturer are TERMINATED and so marked.) To change the strapping option, remove power from display. Remove front panel and display. Locate terminals TP3, TP5, and TP8 at the lower right corner of board (Fig. 7d). Remove the 1 kohm terminating resistor connected between two of these points. For a TERMINATED display, reinstall the 1 kohm terminating resistor between TP3 and TP8 (Fig. 7e). For a BRIDGED display, reinstall the 1 kohm resistor between TP3 and TP5 (Fig. 7f). Mark strapping option on label on rear panel. Replace front cover. Connect display(s) as in Procedure A, using BRIDGED displays for all but the final TERMINATED display.

(3) ***Procedure C (Fig. 7c)***: Check rear panel of display(s) to determine that all are BRIDGED. If any are TERMINATED, modify them as explained in Procedure B above. Connect displays as shown in Fig. 7c. Note that the unmarked terminal on the display output terminal block connects to the NONINV display terminal and acts as a ground lug.

(c) Correct any improper connections and strapping. If one display still malfunctions when power is re-applied, remove the display from the line-up and arrange for its return to the manufacturer for repair. Reconnect and if necessary change strapping on the remaining displays.

(d) If more than one display malfunctions when power is re-applied, one or more displays may be defective. A defective display can cause good displays to malfunction. To determine by elimination which displays are defective:

(1) Remove signal leads from first display and test set.

(2) Disconnect a malfunctioning display from the line-up. If Procedure B (above) was used to connect displays, strap the malfunctioning display TERMINATED.

(3) Connect signal leads from the test set to the display. If the display still malfunctions when power is applied, arrange for its return to the manufacturer for repair.

(4) Repeat steps (2) and (3) for all malfunctioning displays.

(5) Restrap and reconnect good displays.

C. Self-Testing

3.05 The remote display is able to self-test its display segments. When power is applied to the display, all the display segments flash on, showing all eights and decimal points. This allows the operator or maintenance technician to ascertain that all display segments are operating.

3.06 The instrument's self-test routine checks the major circuits of the test set and produces display messages indicating the results of each test. These display messages are listed and described in Table B. A PASS message indicates proper operation of the circuit tested. A FAIL message indicates the need for calibration or repair. The possible sources of failure associated with each FAIL message and the appropriate corrective action are given in Table B. Note that a FAIL message on either the log converter test or the analog circuit test may indicate an out-of-calibration condition and not necessarily the need for repair.

TABLE B
SELF TEST ROUTINE DISPLAY MESSAGES

TEST	DISPLAY MESSAGE, INDICATION	POSSIBLE SOURCE OF FAILURE	CORRECTIVE ACTION
Display	All segments fail to light ,	Fuse Power Supply Microprocessor/Digital	1. Replace blown fuse. 2. Check cable between display. 3. Check cable between main board power supply. 4. Troubleshoot for failure.
	Some segments, numerals, or decimals fail to light.	Segment(s) Display Drivers(s)	Troubleshoot for failure.
	All segments shown 9 and decimal		None
Log Converter	FAIL LC	VF Circuit	1. Calibrate. 2. Troubleshoot for failure.
	PASS LC		None
Instrument Setup	SEND OFF	XFR Switch set to SEND	Set XFR switch to RCV.
	PUSH LEVL	LEVEL switch not engaged	Push LEVL switch.
	PUSH 1004	1004 switch not engaged	Push 1004 Hz switch.
Analog Circuit	FAIL ANLG	Oscillator Filters VF Circuit	1. Set XFR switch to SEND; if no tone, troubleshoot for failure. 2. Calibrate. 3. Troubleshoot for failure.
	PASS ANLG		None
Digital Circuit	FAIL d	Microprocessor/Digital	Troubleshoot for failure.
	PASS d		None

4. THEORY OF OPERATION

A. Input/Output Connections

4.01 Two sets of input/output jacks designated A and B are provided for signal input and oscillator output. In addition to these front-panel jacks, a rear-panel terminal strip may be used for semi-permanent connection into the test set input/output circuits. The rear-panel terminals are designated tip, ring, and sleeve for both the A and the B input/output circuits. These terminals are automatically disconnected from their associated circuits when a plug is inserted into the jack (Fig. 8). A front-panel switch controls transmit and receive directions for the A and B circuits. Either circuit may be used for transmitting or receiving, allowing the test set to simultaneously make measurements over one circuit and send tone over the other.

4.02 The tip and ring leads of the A and B circuits are balanced to ground. The sleeve leads are connect to chassis ground, which in turn, is connected to earth ground through the ac power cord. Both input/output circuits are capacitor-transformer coupled to pass ac and block dc voltages. When a terminated mode is selected, a resistor shunts the transformer primary winding to provide a matched the bridged mode is selected, an input/output impedance of over 20 k ohms is provided by the transformer.

B. Filters (Fig. 9)

4.03 In addition to the level/frequency measurement mode, the 1122B has two noise-measurement modes: idle-channel noise and notched-noise. Idle-channel noise is measured by selecting one of the three noise weighting networks which is then switched into the measuring circuit. These weighting networks are: 3-kHz flat, 15-kHz flat, and C-message. When notched-noise is selected, a 1010-Hz notch filter is switched into the circuit. The notch filter is used in conjunction with one of the three weighting networks.

C. VF Circuit

4.04 The 1122B uses a common circuit to measure both noise and level. Since the circuit has a 20-dB measuring range, it contains a microprocessor controlled auto-range network to range the input signal to within the circuit's measuring capability. This is accomplished by FET switches which cover the 100-dB dynamic range of the test set in 20-dB steps. From the auto-range network, the signal is fed to the detector.

4.05 The true-rms detector produces a dc output proportional to the rms value of the auto-ranged ac signal. This dc signal is then changed to logarithmic form in the log converter. A capacitor in the log converter charges to the reference voltage, then discharges through a resistor. The time required for the capacitor to discharge to the level of the detected voltage is proportional to the logarithm of the detected voltage. The output of the log converter is applied to the microprocessor.

D. Microprocessor

4.06 The microprocessor monitors the status of the front-panel switches and controls the operation of the entire test set. It is supported by an EPROM (erasable programmable read-only memory), counters to perform frequency measurement, and the display drivers.

4.07 The microprocessor receives information from the auto-range network and, in turn, controls the auto-ranging function. It also receives the output of the log converter. When the level-measurement mode is selected, the microprocessor converts the log converter output from a true-rms value to an averaged value, as is customary in telephone practice. The microprocessor analyzes the averaged value to control the noise/level display. These drivers operate the individual segments of the noise/level display. When noise measurement is selected, the microprocessor analyzes the true-rms value from the log converter to control the noise/level display drivers.

4.08 Frequency is measured whenever the level or a noise measurement mode is selected. The frequency measurement circuit consists of a frequency counter, logic, and a binary counter. This circuit is also microprocessor controlled. The output of the frequency measuring circuit is routed to the frequency display drivers which operate on command of the microprocessor.

E. Oscillator

4.09 The signal generator is a voltage-controlled oscillator with automatic gain control for amplitude stability. The basic oscillator frequency is controlled by a resistive voltage divider which provides

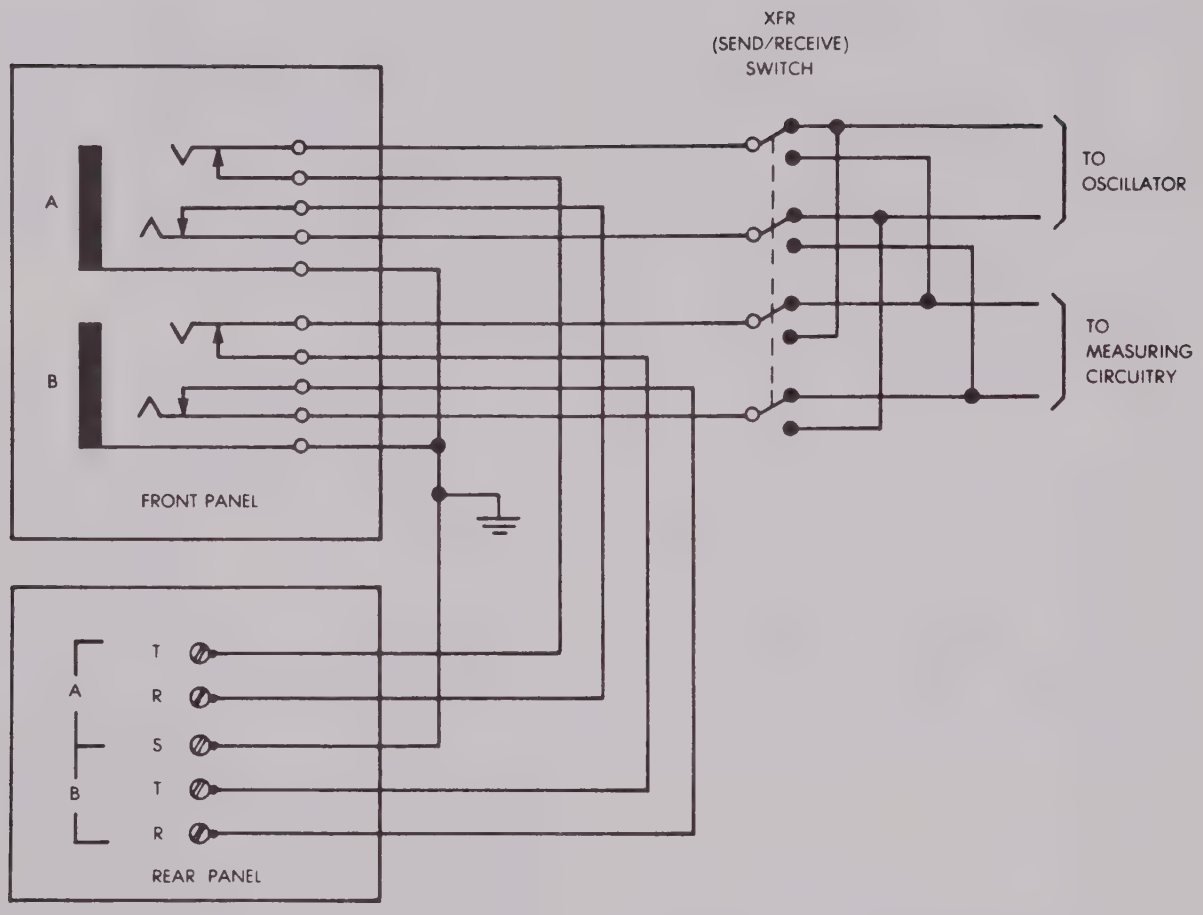


Fig. 8—Input/Output Circuits

selection of three fixed frequencies (404 Hz, 1004 Hz, and 2804 Hz), as well as continuous tuning within each of three overlapping frequency bands (50 Hz to 400 Hz, 300 Hz to 3.9 kHz, and 2 kHz to 20 kHz).

4.10 The fixed-level output of the oscillator is applied to a continuously variable attenuator for output level adjustment. The signal from the attenuator goes to the vf circuit and to the output stage of the signal generator. The frequency and level of the oscillator signal is measured in the test set measuring circuits and then monitored on the displays and speaker. The constant-current output stage is buffered and transformer coupled to the A or B input/output circuit.

F. Remote Display

4.11 The microprocessor in the test set converts the measurements of the transmitted or received signal into a binary serial output. This data is transmitted to the 1122B-03 remote display which translates it into numerical readouts of frequency and noise or level.

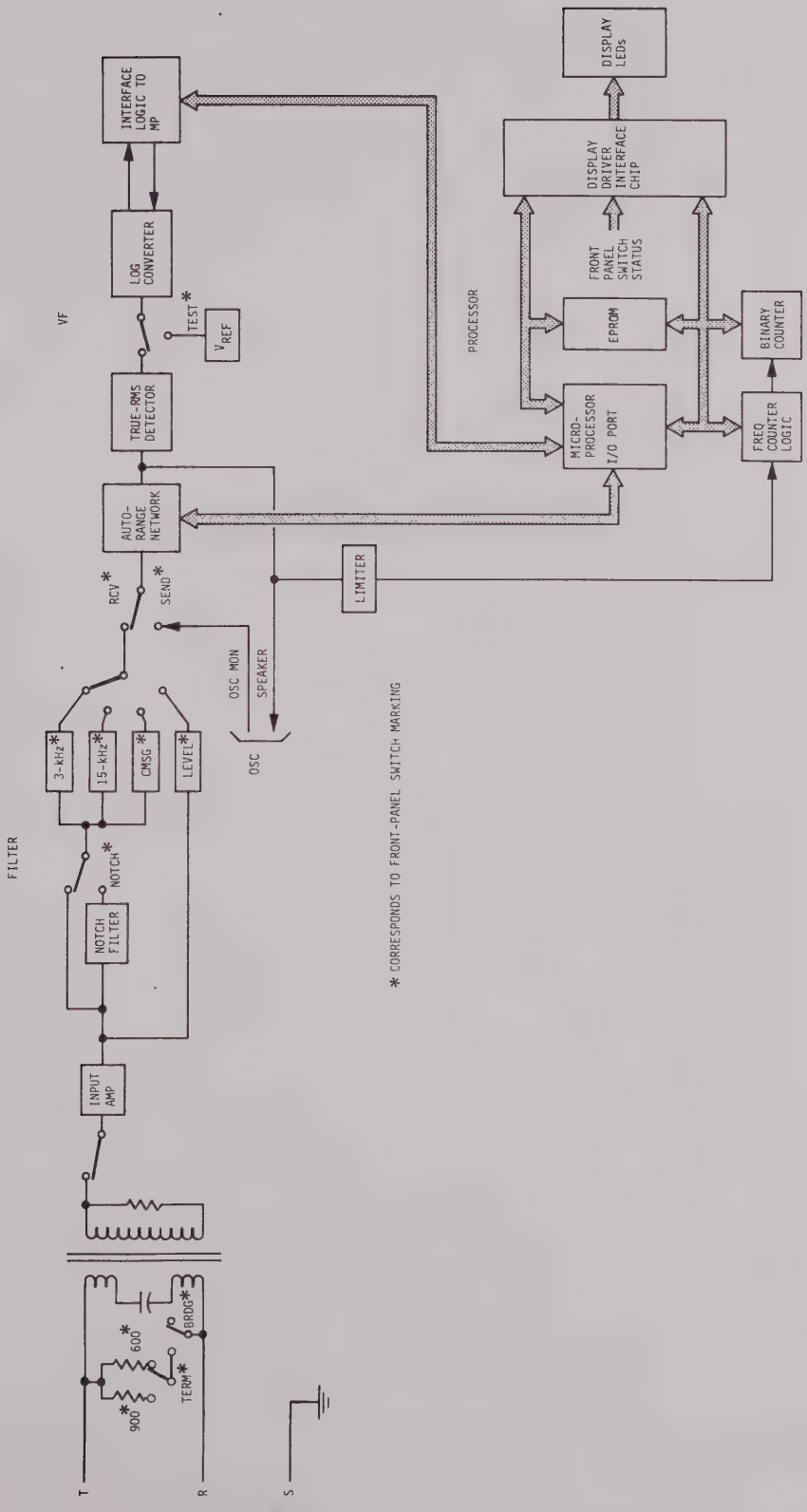
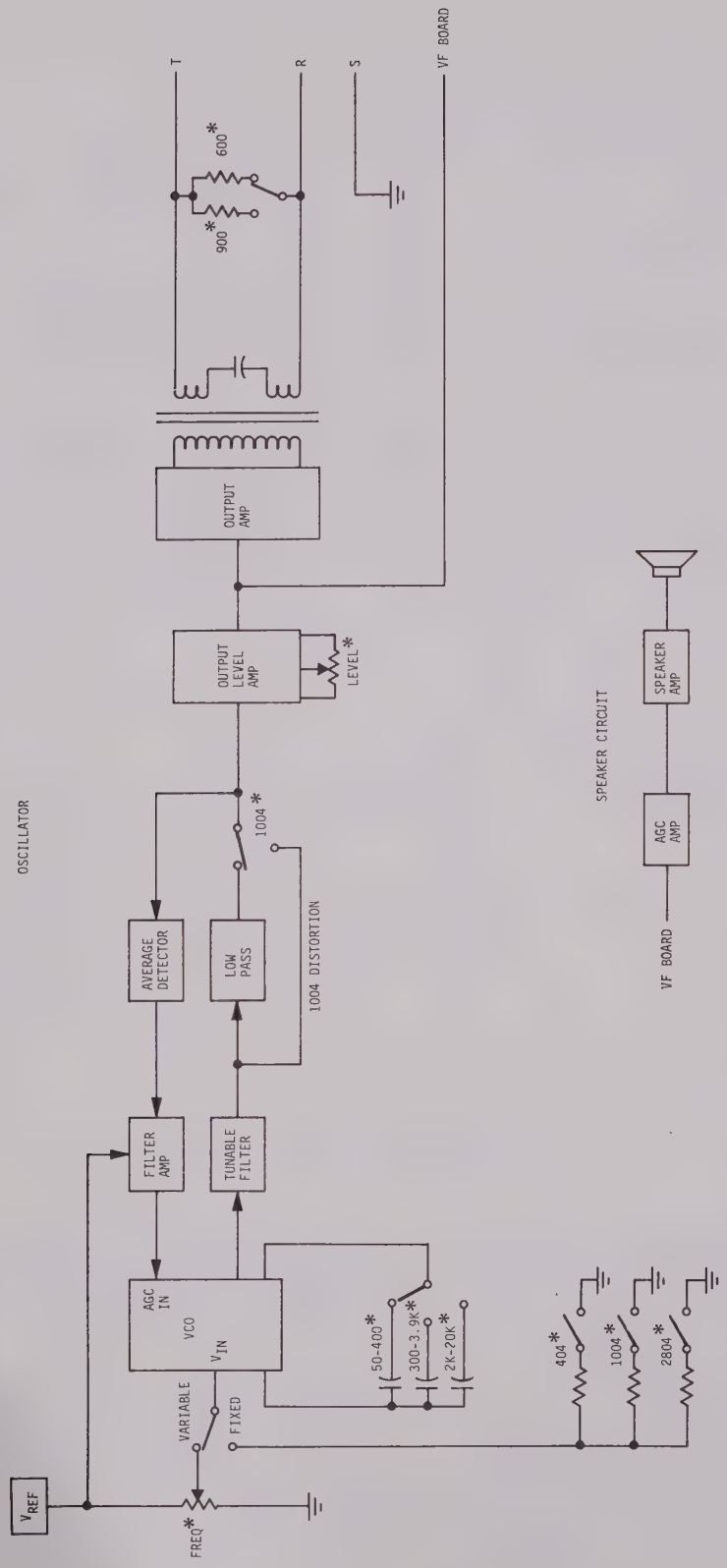


Fig. 9—Block Diagram (Sheet 1 of 2)



* CORRESPONDS TO FRONT-PANEL SWITCH MARKING

Fig. 9—Block Diagram (Sheet 2 of 2)

5. SPECIFICATIONS

A. Test Set

5.01 ***Level Measurements***

Range ..... −49.9 to +10.4 dBm

Frequency ..... 50 Hz to 20 kHz

Resolution ..... 0.1 dB

Input Impedance..... 600 ohms

900 ohms

Bridging

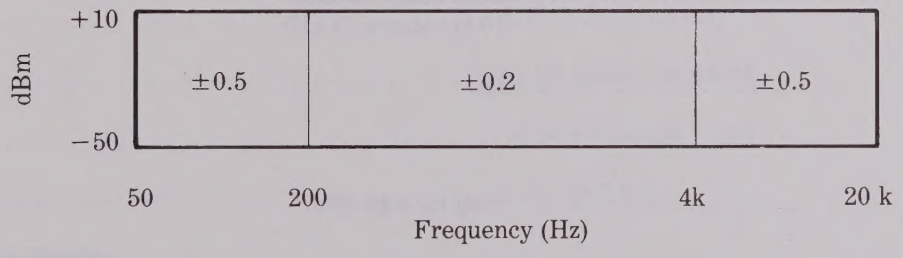
Longitudinal Balance..... 80 dB minimum at 60 Hz

Accuracy

1004 Hz..... 0.1 dB

All other frequencies and levels:

LEVEL ACCURACY



Temperature Coefficient..... ±0.005 dB/° C (0° to 50° C)

5.02 ***Noise Measurements:***

Range ..... 10 to 100 dBrn

Frequency ..... 50 Hz to 20 kHz

Resolution ..... 1 dB

Input Impedance..... 600 ohms

900 ohms

Bridging

Longitudinal Balance..... 80 dB minimum at 60 Hz

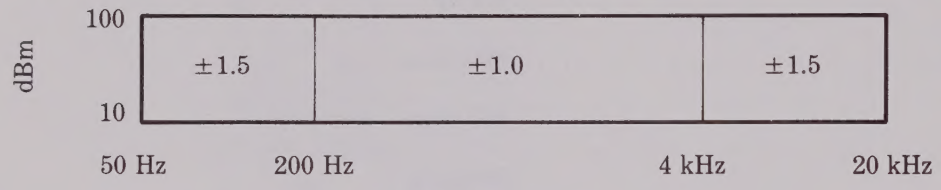
Weighting ..... C-message

3-kHz flat

15-kHz flat

Crest Factor ..... 10 dB minimum below 0.0 dBm (600 ohm reference)

NOISE ACCURACY



5.03 ***Frequency Measurements:***

Range ..... 50 Hz to 20 kHz

Level ..... −40 to +10 dBm

Resolution ..... 1 Hz below 10 kHz
10 Hz above 10 kHz

Accuracy 1Hz

5.04 ***Oscillator:***

Output Level ..... −40 to +10 dBm

Output Frequency

Low Band ..... 50 Hz to 400 Hz

Middle Band ..... 300 Hz to 3.9 kHz

High Band ..... 2 kHz to 20 kHz

Fixed ..... 404 Hz

1004 Hz

2804 Hz

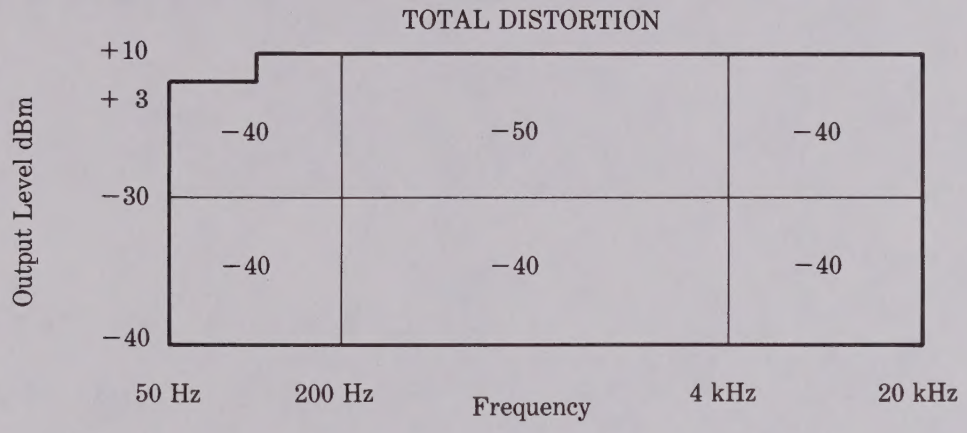
Output Impedance ..... 600 ohms (balanced)

900 ohms (balanced)

Total Distortion

1004 Hz ..... −60 dB or better above −20 dBm

All other frequencies and levels:



5.05 ***Power Supply:***

Power Consumption ..... 8 watts

Voltage ..... 115 V ± 10%, 45-400 Hz

5.06 ***Mechanical:***

Height ..... 1.75 inches (4.5 cm)

Width ..... 17.25 inches (43.8 cm)

Depth ..... 10.50 inches (26.7 cm)

Weight ..... 7 lbs. (3.2 kg)

B. Remote Display

5.07 ***Power Characteristics:***

Power Consumption ..... 4.5 watts

Voltage ..... −48 V dc ± 10%

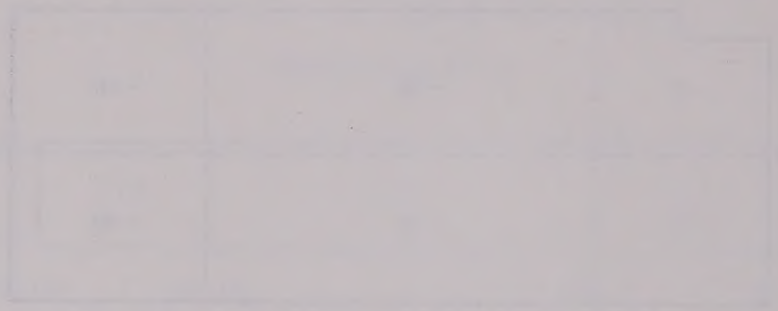
5.08 ***Mechanical:***

Height ..... 11 inches (27.9 cm)

Width ..... 11 inches (27.9 cm)

Depth ..... 1.5 inches (3.8 cm)

Weight ..... 3 lbs. (1.4 kg)



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